



UNIVERSITI
TEKNOLOGI
PETRONAS

FINAL EXAMINATION MAY 2024 SEMESTER

**COURSE : TEB1113/TFB2023 - ALGORITHM AND DATA
STRUCTURE**

DATE : 7 AUGUST 2024 (WEDNESDAY)

TIME : 9:00 AM - 12:00 NOON (3 HOURS)

INSTRUCTIONS TO CANDIDATES

1. Answer **ALL** questions in the Answer Booklet.
2. Begin **EACH** answer on a new page in the Answer Booklet.
3. Indicate clearly answers that are cancelled, if any.
4. Where applicable, show clearly steps taken in arriving at the solutions and indicate **ALL** assumptions, if any.
5. **DO NOT** open this Question Booklet until instructed.

Note :

- i. There are **SIX (6)** pages in this Question Booklet including the cover page
- ii. **DOUBLE-SIDED** Question Booklet.

1. a. Define primitive and non-primitive data structure with any **TWO (2)** suitable examples for each.

[4 marks]

- b. Define Analysis of Algorithm.

[2 marks]

- c. Explain **TWO (2)** main operations of Queue Data Structure.

[8 marks]

- d. Derive the complexity of selection sort algorithm.

[6 marks]

2. a. i. Differentiate between Big O, Omega (Ω), and Theta (Θ) notations.

[6 marks]

- ii. Provide an example for **any TWO (2)** of the terms in **part (a)(i)**.

[2 marks]

- b. Write the algorithms for the following procedures:

- i. PUSH (S, TOP, X)

[4 marks]

- ii. CHANGE (S, TOP, X, I)

[4 marks]

- c. Perform the following operations on a queue with a maximum size of 4:

- Insert 'A'
- Insert 'B'
- Insert 'C'
- Delete 'A'
- Delete 'B'
- Insert 'D'
- Insert 'E'

[NOTE: Draw the queue after each operation]

[4 Marks]

3. a. Draw Preorder, Inorder, and Postorder by traversing the Tree in **FIGURE Q3**.

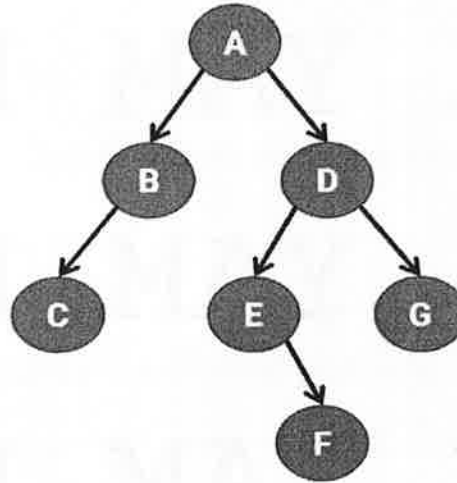


FIGURE Q3: Sample Tree Data Structure

[6 marks]

- b. Construct Binary Search Tree (BST) for the following elements in the order of their occurrences: 50, 25, 75, 22, 40, 60, 80, 90, 15, 30

[6 marks]

- c. Construct AVL Search Tree by inserting following elements in the order of their occurrences: 64, 1, 44, 26, 13, 110, 98, 85.

[8 marks]

4. a. Illustrate using diagram the process to search the element "1" in the array given in **FIGURE Q4a** using Linear Search Algorithm.

2	9	3	1	8
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FIGURE Q4a: Sample Array

[4 marks]

- b. Illustrate using diagram the process to search the element "6" in the array given in **FIGURE Q4b** using Binary Search Algorithm.

-1	5	6	18	19	25	46	78	102	114
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FIGURE Q4b: Sample Array

[8 marks]

- c. Illustrate using diagram the process to sort the array given in **FIGURE Q4c** using Selection Sort Algorithm.

5	1	12	-5	16	2	12	14
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FIGURE Q4c: Sample Unsorted Array

[8 marks]

5. a. Analyze and sort **FIGURE Q5a** using Quick Sort Algorithm:

42	23	74	11	65	58	94	36	99	87
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FIGURE Q5a: Unsorted Sample Array

[8 marks]

- b. Compare Depth First Search (DFS) and Breadth First Search (BFS) as methods for graph traversal, including their respective algorithms and applications of their traversal strategies.

[6 marks]

- c. Analyze and sort **FIGURE Q5c** using Insertion Sort Algorithm:

6	5	3	1	8	7	2	4
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FIGURE Q5c: Unsorted Sample Array

[6 marks]

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